Science & Technology Facilities Council
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Applying the Earth System Grid Security in Heterogeneous Environment of Data Acce Servic

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Coupled Model Intercomparison Project Phase 5

- CMIP5 is a framework for co-ordinated climate change experiments
- Will input into the IPCC 5th Assessment Report (AR5) scheduled for 2013

20 modelling centres	mid-2009: • Simulations Starting
50 numerical experiments	2009: • Model and Simulation Documentation needed
86 simulations (total ensemble members) within experiments	end of 2010: • Data available
6500 years of simulation	early to mid 2012: • Scientific Analysis, Paper Submission and Review
Data to be available from "core-nodes" and "modelling-nodes" in a global federation.	
Users need to find & download datasets, and discriminate between models, and between simulation characteristics.	early 2013!: • Reports

- Software infrastructure under development:

Earth System Grid

InfraStructure for the European Network for Earth System Modelling
is-enes

metafor

Earth System Curator

ESG Access Control Requirements

1. Organisations responsible for model data need the ability to:
   - register users and audit access,
   - keep the user community informed
   - protect finite computing resources
2. But, minimise the technical and administrative barriers to participation
3. Access control must:
   - Layer over heterogeneous mix of individual organizations' existing tools and services
   - whilst at the same time maintaining usability and ease of access.

- *2. and 3. are points of failure for grids / federated systems*

Tackling Heterogeneity

- The problem:
  - Different services
  - Technology stacks
  - Organisational structures
  - Limitations on resources, bandwidth, storage, processing power

Degree of separation of concerns *proportional to* potential interoperability and reusability

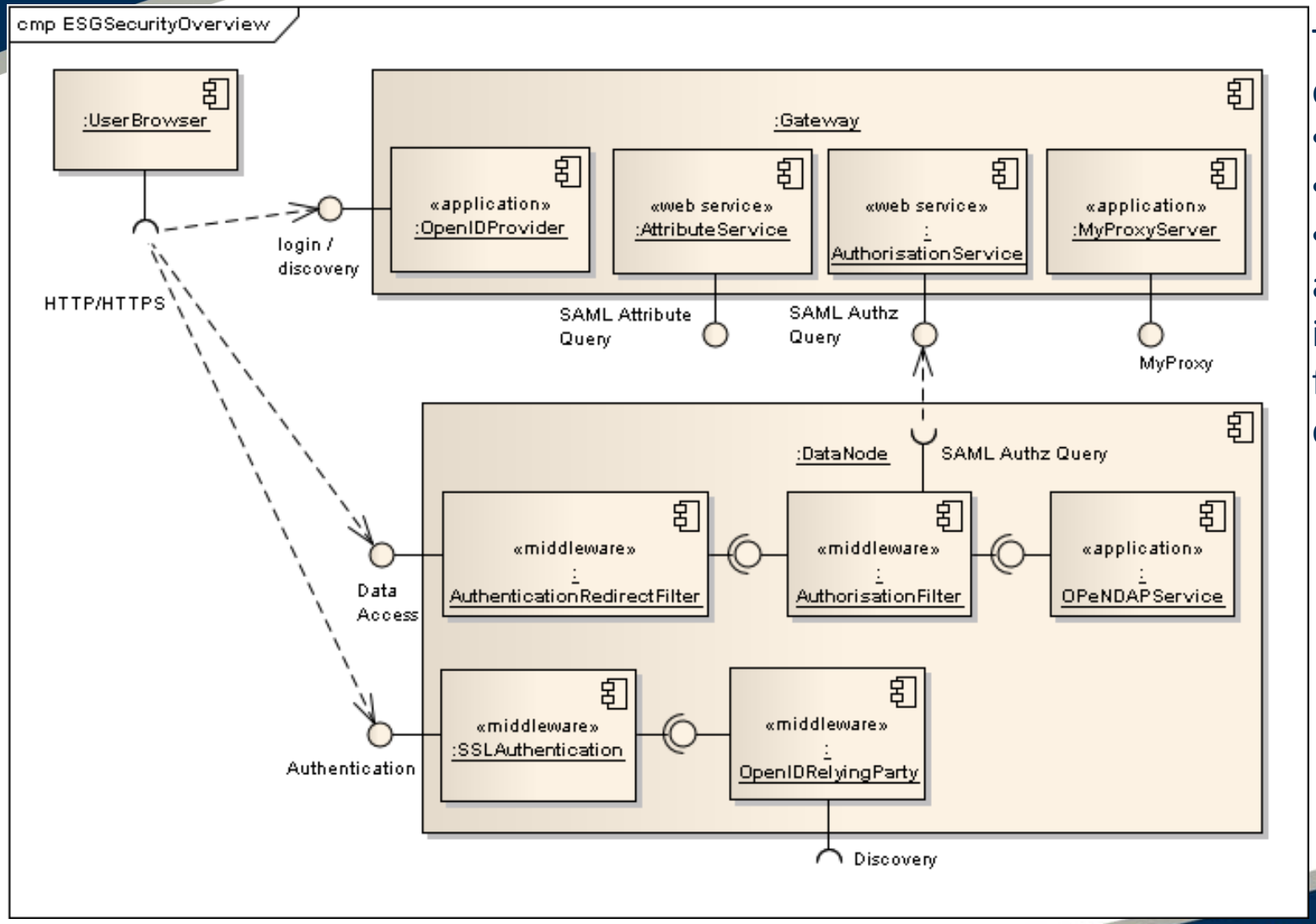
- Some solutions – *separation* through:
  - Web services – SoA
  - but also application middleware
  - REST based principles for Access Control

Separation Requires Interfaces

- Use common libraries or common standards... or both?!
- Answer: common standards, independent implementations
- Common standards:
  - Single sign on: OpenID and MyProxy
  - Attribute Retrieval: SAML 2.0 and OpenID with AX (Attribute Exchange)
  - Authorisation : SAML 2.0
- implementations
  - ESG development team: Java implementation
  - Parallel CEDA implementation in Python

- *Testing across implementations ensures more robust adherence to the standards.*

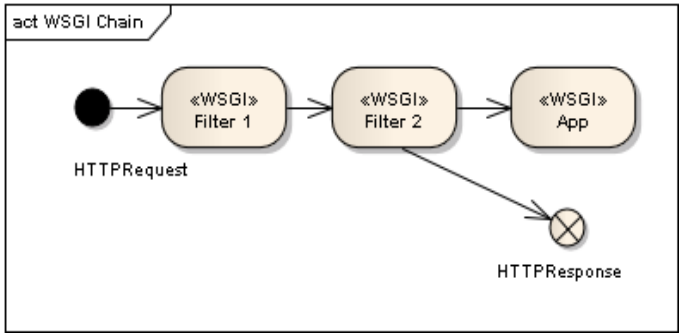
ESG Security Architecture



Two high level components:

- Gateway
- Data Node
- SoA enables mix and match of implementations for each component

Functionality Slicing with WSGI



- SoA – capability to slice up across web service interfaces
- What about the applications themselves?
- Application middleware
  - in Python => WSGI (Web Server Gateway Interface)
  - Akin to Java servlets
  - A web application can be separated into a chain of middleware components each taking a pass over the input request and then passing it on to the next middleware or short circuiting the chain to return a response
  - Slicing based on the functionality being provided

REST and Access Control Policy

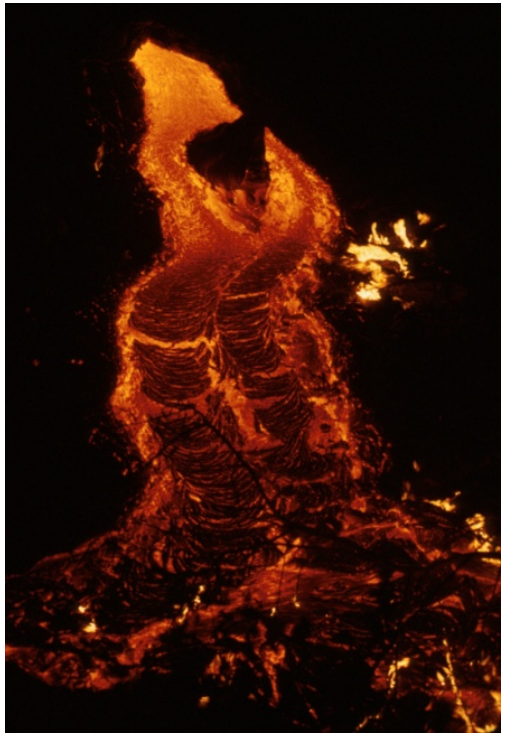
"With URI-based (REST) web services, administrators can apply ACLs [Access Control Lists] to the service itself and to every document that passes through the service, because each of them would have a URI."

"It is much harder to secure an RPC-based system where the addressing model is proprietary and expressed in arbitrary parameters, rather than being group together in a single URI."

- http://www.xml.com/lpt/a/923 REST and the Real World, Paul Prescod, 20 Feb '02

- Different applications and toolkits each with their own security API
- For HTTP, access control policy is determined by the characteristics of a request: the URI, the method GET, PUT etc.
  - Properties which are independent of the specifics of any given API toolkit.
  - This makes it independent of the application's inner workings => separation from the application

Preserving Modularity



An excuse for mentioning volcanoes

- Challenges to modularity:
  - Requirements solidify, implementation beds down and can become brittle – *lava flow antipattern*
  - Developers can prefer application specific security APIs
- Preserve with:
  - Vigorous unit testing
  - Perhaps more importantly integration testing
    - Do the components still fit together OK?!
- Is it worth preserving?

COWS – CEDA OGC Services and ESG Security

- COWS – CEDA OGC Web Services
- Python implementation with the Pylons framework
- COWS WMS secured with generic ESG security filters
  - Can accept SSL and OpenID based authentication
- COWS Client
  - Open Layers based
  - Understands ESG Security enabled COWS WMS:
    - Invoke OpenID based sign in on HTTP *401 Unauthorized* response.
    - *403 Forbidden* => user doesn't have the required access rights
- Demo

Future Plans

- Tackle delegation
  - *MashMyData* Project: user delegates to portal data mash up application which can retrieved secured datasets from other services
  - Proxy certificates
  - *OAuth*
- OGC Authentication Interoperability Experiment (with OpenID)
- OGC WPS (Web Processing Service) implementation and access control policy
  - URI based where possible but
  - policies based on POST'ed request content may be needed
- XACML (eXtensible Access Control Markup Language)
  - Richer functionality for policy expression
  - Standardised policy
  - Python XACML 2.0 implementation recently completed